

EARTH OBSERVATION ARCHIVE ACTIVITIES AT DRA FARNBOROUGH

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ABSTRACT

Space Sector, Defence Research Agency (DRA), Farnborough have been actively involved in the acquisition and processing of Earth Observation data for over 15 years. During that time an archive of over 20 000 items has been built up.

This paper describes the major archive activities, including:-

- operation and maintenance of the main DRA Archive.
- the development of a prototype Optical Disc Archive System (ODAS).
- the catalogue systems in use at DRA.
- the UK Processing and Archive Facility for ERS-1 data.
- future plans for archiving activities.

Key Words:- Data archiving, earth observation, catalogue systems.

1. INTRODUCTION

Space Sector, Defence Research Agency, Farnborough (formerly RAE Farnborough) have been actively involved in the acquisition and processing of Earth Observation data for over 15 years. During that time an archive of over 20 000 items has been built up. Serco Space has had a long

association with the operations of Space Sector and is currently involved with a number of activities concerned with improving the efficiency of archive operations.

This paper provides a summary of the major archive activities under the following headings:-

- maintenance of the DRA Archive.
- Optical Disc Archive.
- Catalogue Systems.
- ERS-1 Archive.
- Future activities.

2. MAINTENANCE OF DRA ARCHIVE

Tapes in the main DRA archive are divided into three categories:-

- Master - the original CCT as received from the satellite groundstation (such as the DRA groundstation at Lasham) or data distributor.
- Copy - a backup copy of the master tape is held in a separate building.
- Image - a transcription of the original tape into a standard format (RAE format).

At the time of writing (October 1992) the DRA Archive contained the image sets shown in Figure 1.

CATEGORY	NUMBER OF IMAGES
Landsat (TM and MSS)	2070
SPOT	782
Geosynchronous (Primarily Meteosat)	142
Seasat	1826
Geocoded Images (Landsat & SPOT)	179
Various Tapes	8954
AVHRR	2578
Total	16531

Figure 1 - Breakdown of DRA Archive.

Note that the number of images is less than the total number of tapes in the archive for two reasons:-

- large images (such as Landsat-TM) occupy more than one tape.
- a single listed image can occur as multiple format tapes (eg, master, copy, image).

The 'various tapes' category includes system back-ups, processed images, airborne SAR and thematic mapper campaigns, and DRA products such as the AVHRR mosaics of Europe and Antarctica.

All tapes are maintained in a temperature and humidity controlled environment (see Figure 2):-

ENVIRONMENTAL ASPECT	VALUE
Temperature	18°C to 24°C
Rate of change of temperature	Less than 6°C/hour
Relative Humidity	40% to 60%

Figure 2 - Recommended Storage Conditions for Open Spool Tapes (based on BS4783: Part 2)

Archiving activities include issue and recall of copy tapes, tape maintenance and evaluation and recycling of 'scratch' tapes.

3. OPTICAL DISC ARCHIVE SYSTEM

In 1985 the DRA commenced a programme with the objective of transferring the important elements of the

archive to optical disk. The plan for the three stages was as follows:

- procure hardware and develop software for controlling optical disc drives.
- implement a semi-operational prototype system
- implement an interoperable catalogue system to control the optical disk archive

Stage 1 of the program was completed, by Logica Space and Defence Systems Limited, in 1988 and stage 2 in 1990. Stage 3 has not currently been initiated due to changing requirements within DRA.

ODAS can perform online archive functions such as accessing optical discs to read or write data, as well as catalogue functions such as searching a database.

The ODAS hardware consists of an Integrated Automation jukebox with ATG Gigadisc drives interfaced to a PRIME 2655 computer.

4. CATALOGUE SYSTEMS

To support the smooth operation of the Archive, efficient cataloguing systems are essential. Catalogue systems currently in use at DRA include:

- REMIS.
- Photolab Management and Administration System (Photo-MAS).
- PARADOX Tape Catalogue System.

4.1 REMIS

REMIS is the main catalogue system for the DRA Archive. It is hosted on a PRIME computer and based on the INFO database system. It is used by the Tape Librarians to enter and validate holdings and by a variety of users to perform data searches.

REMIS uses two indexes to maintain uniqueness of records:-

- tape identification numbers
- physical location code (building, rack, slot).

Three main types of search can be performed:-

- retrieve information corresponding to a known tape number.
- composite query for a specific image category (eg, SPOT).
- area search (lat, long) across all image categories based on nominal scene centres.

The results of a typical REMIS search can be seen in Figure 3. The constraints specified were (Satellite = LANDSAT) AND (Sensor = TM) AND (Date ≥ 1-9-86) AND (Date ≤ 30-9-86).

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LANDSAT RETRIEVAL

SATPATH/ROW	QUAD	DATE	SEN	CC	LATITUDE	LONGITUDE	COUNTRY/AREA
5 196 27.0	4	6/9/86	TM	1213	46.70N	6.63E	FRANCE/SWITZERL
AND							
5 204 21.0	3	14/9/86	TM	1111	55.42N	2.73W	UK
5 204 21.0	1	14/9/86	TM	3000	56.84N	2.49W	UK
5 204 22.0	0	30/9/86	TM	7173	54.52N	2.96W	UK

Key:

SAT	Satellite Number.
QUAD	Image Quadrant (0 = whole image).
CC	Cloud Cover (0 - 8 for NW, NE, SE, SW of image).

Figure 3 - Results of REMIS Search

4.2 Photolab Management and Administration System (Photo-MAS)

The Photo-MAS was developed to enable records of Archive resources used by the Space Sector Photolab to be maintained. The Photo-MAS maintains a catalogue of film and print holdings as well as an 'ancestry record' showing the original tapes that the product was derived from.

The overall Photo-MAS system can be seen in Figure 4. Information stored in the MAS database is transferred, via the MAS executive to Photolab operators, and onward to customers. The modular design of the Photo-MAS will enable a direct link to certain customers to be provided at a later stage, if required.

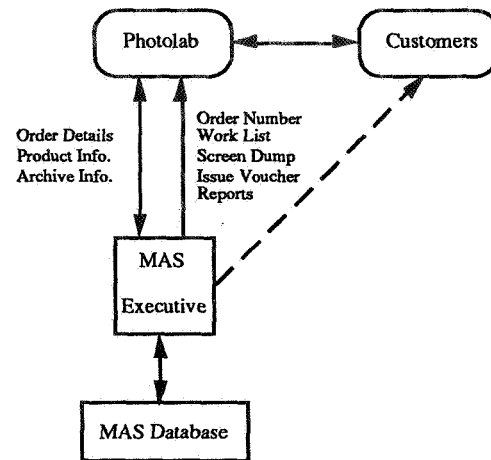


Figure 4 - MAS Top-Level Model

The system runs on a SUN-4 WorkStation using the ORACLE RDBMS.

4.3 PARADOX Tape Catalogue System

The PARADOX Tape Catalogue System runs on a standard IBM-PC 386 compatible computer with software developed using the PARADOX Application Language (PAL).

The system is based around three databases:

- image types database, which contains unique records for specifying each category of image
- storage location database specifying all possible physical locations of storage media
- image catalogue database which contains the main database records

The user can perform a variety of operations including a number of search options. These include point searches (to determine whether a point lies within an image boundary) and area searches (to determine the percentage overlap between an image and a specified area).

Distributed users of the system can be supplied with a run-time version of the system and regular updates of the database on 5 1/4" or 3 1/2" floppy disk.

5. ERS-1 ARCHIVE

DRA Farnborough is also involved with the European ERS-1 mission. Serco Space is responsible (under subcontract to National Remote Sensing Centre Limited) for operating the Earth Observation Data Centre (EODC) at Farnborough which constitutes the UK Processing and Archive Facility (UK-PAF). Data is stored in a purpose-built archive designed to hold HDDTs and Optical Discs.

The major activity of the UK-PAF is the archiving and processing of Synthetic Aperture Radar (SAR) data from ERS-1. The unprocessed data is stored on HDDT with the resultant format on CCT. The Centre also archives low-bit rate data (primarily Radar Altimeter and Scatterometer data), with raw data incoming on optical disc and products stored on Exabyte cartridge. At the time of writing (October 1992) the archive contained approximately 5000 items (see Figure 5 for details). Eventually the archive will store 10 000 HDDTs representing two years worth of operational SAR data.

MEDIUM	DATA TYPE	NUMBER
Optical Disc	Low-Bit Rate (LBR) Data	1688
HDDT	SAR Data (Unprocessed)	3184
CCTs	SAR Products	100
Exabyte Cartridge	LBR Products	200
Total		5172

Figure 5 - Contents of UK-PAF Archive.

Every tape booked in is subjected to Quality Control (QC) processing before an archive report is generated. The report is then despatched to ESA to be stored on their Central User Services (CUS) database.

6. FUTURE ACTIVITIES

Future archiving activities at DRA Farnborough are in an early stage of planning but possible directions include:-

- preparation for involvement in the archiving activities of future European Earth Observation Missions (eg, ERS-2, POEM-1).

- archiving of digital cartographic and other GIS data.
- transfer of data on magnetic media to optical disk.
- general adoption of cheaper, more flexible catalogue systems using standard components.
- improved QA and configuration control.
- assessing catalogue inter-operability requirements.

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